Tuberculosis should be considered when broad-spectrum antibiotherapy is ineffective and no evident cause is found for urinary infection following ECL.

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Bacteremia due to *Roseomonas* spp.

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Pink-pigmented, oxidative Gram-negative bacteria have occasionally been isolated from various clinical samples [1]. However, their clinical significance is still frequently debated [2]. We report a case of catheter-related bacteremia due to a pink Gram-negative coccobacillus, *Roseomonas gilardii*, in an immunocompromised patient and we also review the literature in order to delineate the epidemiology and pathogenic role of *Roseomonas* spp. isolated from blood samples.

Case report

A 59-year-old man with M1-type acute myelogenous leukemia developed fever (39°C) while on chemotherapy, 4 months after the implantation of a Hickman catheter. One out of the four blood cultures obtained through a peripheral vein grew pink-pigmented bacteria and the patient was afebrile when discharged after 10 days of intravenous imipenem and tobramycin followed by oral ciprofloxacin for 5 days. The patient was re-admitted 2 weeks later with a new febrile episode (39°C), and a similar microorganism was isolated in two out of three blood cultures. The patient defervesced with intravenous ceftazidime for 13 days followed by oral ciprofloxacin for 10 days and was discharged. A third episode occurred 2 weeks after the second discharge. Lysis–centrifugation blood cultures obtained through both catheter lumens showed colonies too numerous to count. A simultaneous peripheral blood sample treated with lysis–centrifugation showed no growth. The Hickman catheter was removed after 10 days but unfortunately the tip was not sent for culture. The patient was discharged with oral ciprofloxacin and cloxacillin for 7 days. Five months later he has not had further episodes of bacteremia. All pink-pigmented bacteria grown from blood cultures of the three episodes of bacteremia were identified as *Roseomonas gilardii*.

In all cases, pink-pigmented colonies grew after 48 h of incubation at 37°C on Columbia blood agar plates. The Gram stain revealed Gram-negative, non-vacuolated coccoid rods, arranged in pairs. The organism grew on MacConkey agar and weakly on Columbia blood agar at 42°C. Catalase and oxidase tests were positive, although the latter test was delayed for 30 s. The organism was non-fermentative on triple sugar iron agar, and the API 20NE identification system (BioMérieux, Marcy L'Etoile, France) gave positive results for urease production, and oxidation of glucose, arabinose, malate and citrate, while nitrate reduction, glucose fermentation, indole production, arginine dihydrolase, β-glucosidase (esculinase), gelatinase and β-galactosidase tests and oxidation of mannose, mannitol, *N*-acetylglucosamine, maltose, gluconate, caprate, adipate and phenylacetate were negative (code number 0241045). The API computer database identified the microorganism as *Pseudomonas mesophilica*, and citrate oxidation was the only unacceptable test. Because this database does not include the genus *Roseomonas*, further tests were performed to confirm the identification.

Fatty acid analysis was performed by gas–liquid chromatography as described previously [1], and identification of the fatty acid methyl esters was confirmed by computer-calculated equivalent carbon-chain-length values. The cellular fatty acid composition of the strains was identical to that of previously described pink coccoid groups I, II and III, revealing the presence of 3-OH-$C_{16:0}$, $C_{18:1B}$, 2-OH-$C_{18:1}$, $C_{19:0D}$ 11,12 and 2-OH-$C_{19:0D}$11,12, all absent in *Methylobacterium mesophilicum*, and the absence of 3-OH-$C_{14:0}$ (present in this species of *Methylobacterium*) [1]. These data, together with the lack of both acetate utilization and acid production from methanol, confirmed that our isolates belonged to the genus *Roseomonas*. According to the biochemical characteristics obtained with the API 20NE system and oxidation of glycerol, the microorganisms were identified as *Roseomonas gilardii*.

All isolates in our case were susceptible to ampicillin (≤0.5 mg/mL), amoxicillin/clavulanic acid (≤2/1 mg/mL), cefazolin (≤4 mg/mL), gentamicin (≤1 mg/mL), tobramycin (≤1 mg/mL), amikacin (≤4 mg/mL), ciprofloxacin (≤1 mg/mL), tetracycline (≤4 mg/mL), aztreonam (≤8 mg/mL) and imipenem (≤4 mg/mL), and they were resistant to cefuroxime (>16 mg/mL), cefotaxime (>32 mg/mL), ceftazidime (>16 mg/mL) and trimethoprim/sulfamethoxazole (>2/32 mg/mL). No increase in the MICs was observed in the susceptibility patterns of the three isolates after antimicrobial therapy.

In the MEDLINE index from January 1970 to December 1996 we were able to find 10 satisfactorily documented cases (11 including ours) of *Roseomonas* spp. bacteremia, and these are summarized in Table 1. Nine cases involved adults and two involved children (a previously healthy 9-month-old boy with epiglottitis and a 15-year-old girl with acute lymphocytic leukemia), the median age was 56 years (ranging between 9 months and 73 years) [2,3]. Six patients were female and five were male. In nine cases the patients presented with an underlying disease (eight were immunocompromised patients): four of them presented with acute leukemia [2,4,5], one was diagnosed with cancer, one was diagnosed with Crohn's disease [5], one presented with end-stage renal disease in hemodialysis [6],

Table 1 Clinical characteristics of patients with *Roseomonas* spp. bacteremia

Year/Ref	Country	Age/sex	Underlying condition[b]	Clinical characteristics	Documented infection	Antimicrobial therapy	Outcome (days)
1988 [3]	Nigeria	<1[a]	None	Fever, epiglottitis	Blood	Ampicillin	Cured
1988 [5]	USA	19/F	Breast cancer	Fever, chills	Blood[c,e]	No data	Cured
1988 [5]	USA	62/F	Crohn's disease	Fever, chills	Blood[c,e]	No data	Cured
1988 [5]	USA	57/F	AML	Fever, chills	Blood[c,e]	No data	Cured
1989 [4]	USA	40/F	AML	Fever, chills	Blood[d,e]	Piperacillin, gentamicin	Cured
1989 [4]	USA	60/M	Intra-abdominal abscesses	Fever, schock	Blood[e]	Cefamandole	Death (+3)
1993 [8]	USA	56/M	End-stage renal disease in hemodialysis	Shock, nausea, vomiting dyspnea	Blood[d,e]	Vancomycin, gentamicin	Death (+1)
1996 [2]	USA	73/F	Diabetes mellitus	Fever, bronchitis	Blood	Penicillin, gentamicin	Cured
1996 [2]	USA	36/M	None	Fever	Blood	No data	Cured
1996 [2]	USA	15/F	ALL	Fever	Blood[d,e]	Ceftazidime, gentamicin, vancomycin	Cured
Ours	Spain	59/M	AML	Fever. Three relapsing episodes	Blood[c,e]	1st episode[f]: IMP, TOB, CIP. 2nd episode: CAZ, TEI, CIP. 3rd episode: IMP, VA, CIP, OX. catheter removal	Cured

[a] Nine months.
[b] AML, acute myelogenous leukemia; ALL, acute lymphocytic leukemia.
[c] Blood cultures obtained through an indwelling vascular catheter. Catheter-related bacteremia.
[d] Purportedly catheter-related bacteremia.
[e] Nosocomially acquired bacteremia.
[f] IMP, imipenem; TOB, tobramycin; CIP, ciprofloxacin; CAZ, ceftazidime; TEI, teicoplanin; VA, vancomycin; OX, oxacillin.

one was diabetic [2] and one without immunosuppression had a pancreatic abscess [4]. The two cases without underlying disease were a 9-month-old boy with epiglottitis and a previously healthy patient [2]. Eight cases were nosocomially acquired. Four of them were diagnosed as catheter-related bacteremias, another three were purportedly catheter-related, and no information was available for one. Among the 11 cases, nine had a favorable outcome and two patients developed septic shock and died before the blood cultures became positive.

Pink-pigmented, oxidative Gram-negative bacteria have been isolated from various clinical and environmental sources. This group includes bacteria with different growth and biochemical characteristics [4,7]. In 1993, Rihs et al [6] proposed the new genus *Roseomonas* (formerly 'pink coccoid' CDC groups I to IV). Members of this genus are Gram-negative, nonfermentative, pink-pigmented, coccoid rods, similar to *Methylobacterium mesophilicum* (*Pseudomonas mesophilica*), although they differ from it on the basis of cellular fatty acid composition [1], non-vacuolated coccoid morphology on Gram stain, growth at 42°C, growth on MacConkey agar, lack of acetate utilization and lack of acid production from methanol [7,8]. This new genus includes three named species, *Roseomonas gilardii*, *Roseomonas cervicalis* and *Roseomonas fauriae*, and three unnamed genomospecies [6]. The natural habitat of *Roseomonas* spp. is not clearly known, although occasional isolates from contaminated saline and plastic ice balls have been reported [1].

Even though isolation of *Roseomonas* spp. from clinical samples is uncommon, they have been isolated from the genitourinary tract, wounds, abscesses and blood [3–5,8]. Recently, Struthers et al [2] described an overview of cases in which *Roseomonas* spp. were isolated from different clinical samples from 35 patients; however, in most cases they indicated that the clinical significance of the isolates was uncertain and suggested that there is a need for detailing the association of *Roseomonas* species with specific disease processes.

Information on antimicrobial susceptibilities of the genus *Roseomonas* is very scarce [4–6]. Rihs et al tested 26 antimicrobial agents against 42 strains. Some strains were susceptible to penicillins and first-generation cephalosporins; however, these drugs showed, in general, poor in vitro activity against most isolates. Penicillins combined with a β-lactamase inhibitor were active against many of the isolates [6]. The strain isolated in our case was susceptible to ampicillin and first-generation cephalosporins. Most strains were susceptible to quinolones and 35% were susceptible to trimethoprim/sulfamethoxazole. All strains but two (one was resistant to tobramycin and another to tetracycline) were susceptible to imipenem, aminoglycosides and tetracycline. In our case, despite the three consecutive courses of adequate antimicrobial agents, bacteremia recurred until the catheter was removed. Unfortunately, there is no information about what happened with the catheters in seven catheter-related bacteremias caused by *Roseomonas* spp. reported in the literature.

Pink coccoid oxidase-positive microorganisms should not be simply disregarded as contaminants. Microbiologists and clinicians should be aware of the potential clinical significance of these microorganisms, particularly when isolated in the blood of patients with indwelling intravascular devices.

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Methylobacterium bacteremia in AIDS

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Methylobacterium species are rare human pathogens, primarily causing infection in patients with severe underlying disease and/or in the immunocompromised state [1–4], to our knowledge, only 21 cases of human methylobacterium infection have been reported in the world's literature. Underlying diseases reported in these patients include renal failure, tuberculosis, and malignant neoplasms of the lung and uterus [3]. Additionally, several methylobacterium infections have been reported in leukemia patients after bone marrow transplantation [3]. One case of cutaneous infection was reported in an immunocompetent patient [5], and one case from a patient with AIDS [3]. Here we describe a case of methylobacterium bacteremia in a patient with AIDS.

At Episcopal Hospital in Philadelphia, Pennsylvania, a 35-year-old Hispanic male with AIDS presented with a 5-day history of intermittent fever (as high as 39.4°F), and blurred vision. The patient had a history of HIV positivity and AIDS, which were documented 9 months prior to this admission, when he was diagnosed with *Pneumocystis carinii* pneumonia. Three weeks prior to admission, the patient had undergone a laparoscopic cholecystectomy for cholelithiasis. He was taking pentamidine, ranitidine, and alprazolam. The patient was employed as a custodian at the airport and reported frequent occupational hand lacerations; he denied intravenous drug use or homosexuality.

On examination, he exhibited tachycardia and had a blood pressure of 106/70. His temperature was 37.6°C. Bilateral retinal hemorrhages were noted, more extensive on the left than on the right. There were right basilar rhonchi. He was anemic (hemoglobin 12.5 g/dL, hematocrit 39%) but had a normal peripheral blood white cell count (4750/mm^3) and differential; however, the absolute CD4 count on admission was 6/mm^3. Initial bacterial blood cultures showed no growth, and urinalysis and urine culture were negative. A lumbar puncture was performed, and did not show evidence of infection. The patient was examined by an ophthalmologist, who noted right-sided retinitis and diffuse retinal ischemia, without necrosis, vessel sheathing, or vitritis.

The patient's temperature remained below 37.8°C for the first two hospital days. On the evening of the third hospital day, his temperature spiked to 38.4°C, and two blood cultures for mycobacteria were drawn from two different sites, 4 h apart (Bactec 13A medium, Becton Dickinson, Cockeysville, MD) Growth of a small, coral-pigmented, Gram-variable, motile, vacuolated bacillus was obtained from both cultures by subculture to Sabouraud, buffered charcoal–yeast extract and 7H10 agars (Becton-Dickinson, Cockeysville, MD). Subcultures to sheep blood, chocolate and MacConkey agars were negative. However, this isolate was positive on rabbit blood agar with no hemolysis. The isolate grew in 10% methanol, grew at 25° and 37°C, but did not grow at 42°C. The organism was aerobic, oxidase, catalase and urease positive and nitrate negative, typical of isolates from the genus *Methylobacterium* [3]. The isolate was identified as *Methylobacterium* spp. by the Centers for Disease Control and Prevention (Atlanta, Georgia).

We feel that the case described here was a true methylobacterium infection. The patient did have concurrent sinusitis and cytomegalovirus retinitis, and HIV-related fever cannot be absolutely excluded, but the magnitude of the fevers would argue against the first two possibilities, and the acute onset and eventual resolution of the fevers with treatment would argue against the last. The fact that two sets of blood cultures, drawn 4 h apart, from two different sites, grew the same organism is also strong evidence of a true bacteremia and probably true infection. The portal of entry in this patient was not certain, but his occupation in waste collection (during the performance of which he described frequent hand lacerations) suggests a possible source.

Methylobacterium species are saprophytic, pink-pigmented, Gram-negative bacilli that rarely cause human disease [1–3]. Most cases of human infection have been in patients who are immunocompromised due to severe underlying disease, or are immunosuppressed; however, one case of cutaneous methylobacterium infection has been reported in an immunocompetent individual [5]. The genus *Methylobacterium* includes eight species, *Methylobacterium extorquens, M. fujisawaense, M. mesophilicum, M. organophilum, M. radiotolerans, M. rhodinum, M. rhodesianum* and *M. zatmanii* [2]. The classification is based on morphology, biochemical characteristics, and DNA homology, which provided the basis for the relocation of some species from other genera, including *Pseudomonas* and *Vibrio. Methylobacterium* species include organisms formerly classified as: *Pseudomonas mesophilica, Pseudomonas methanolica, Vibrio extorquens, Protomonas* spp., *Protaminobacter rubra,* and *Mycoplasma rubra* [2].